Keeping Legacy Systems Viable Using CEC

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Today's Threats Are Even More Dangerous

Detection challenge continues to be difficult

– Faster, lower, smaller threats

– Environmental factors: land background, clutter, ducting, multi-path, jamming
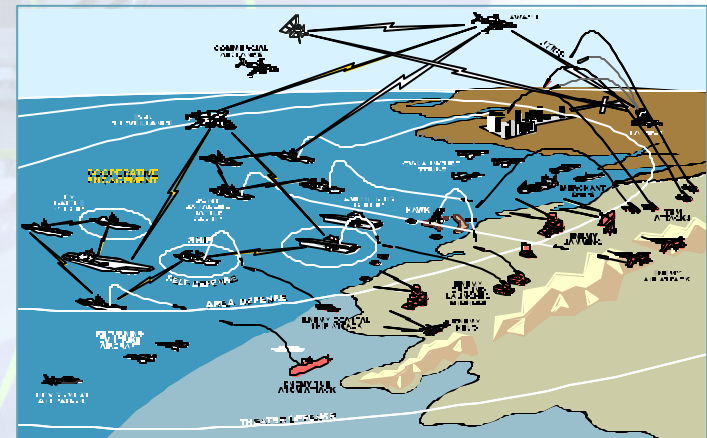
– Compressed battlespace

Cruise missile development and proliferation

– More than 80 nations deploy anti-ship cruise missiles

– Land attack cruise missile threat emerging

Stealthier aircraft

China's C-802 Cruise Missile

Air Defense Operations

Tougher threats in more stressing environments

Can Existing Systems Meet the Challenge?

E-2C

AEGIS

ACDS/SSDS

- Significant cost investment in today's systems

- Existing systems will be utilized for years

- Techniques to enhance existing sensors sought

- How can a limited number of new sensors be exploited?

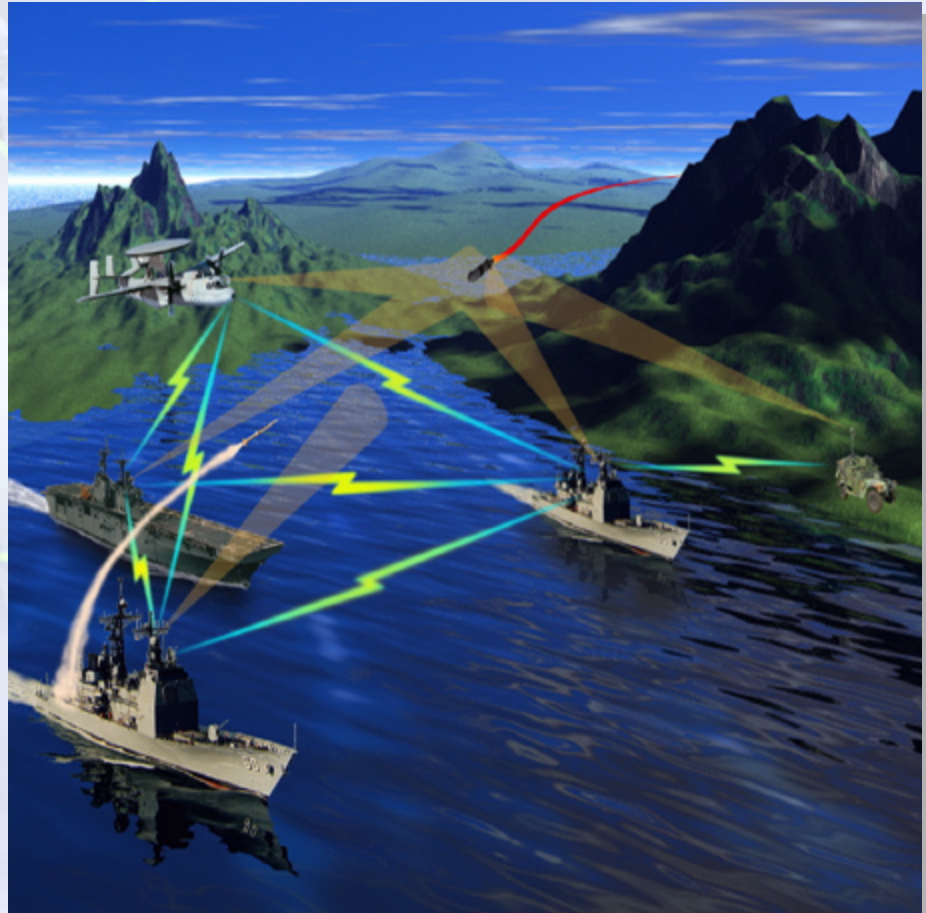**A transformation in tracking capability is required**

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Cooperative Engagement Capability

System Description

- Exchanges sensor measurement data from all surveillance and fire control sensors in network

- Fuses data into composite tracks vice choosing best track after correlation

- Takes tactical advantage of battle force sensors having multiple look angles and frequency diversity
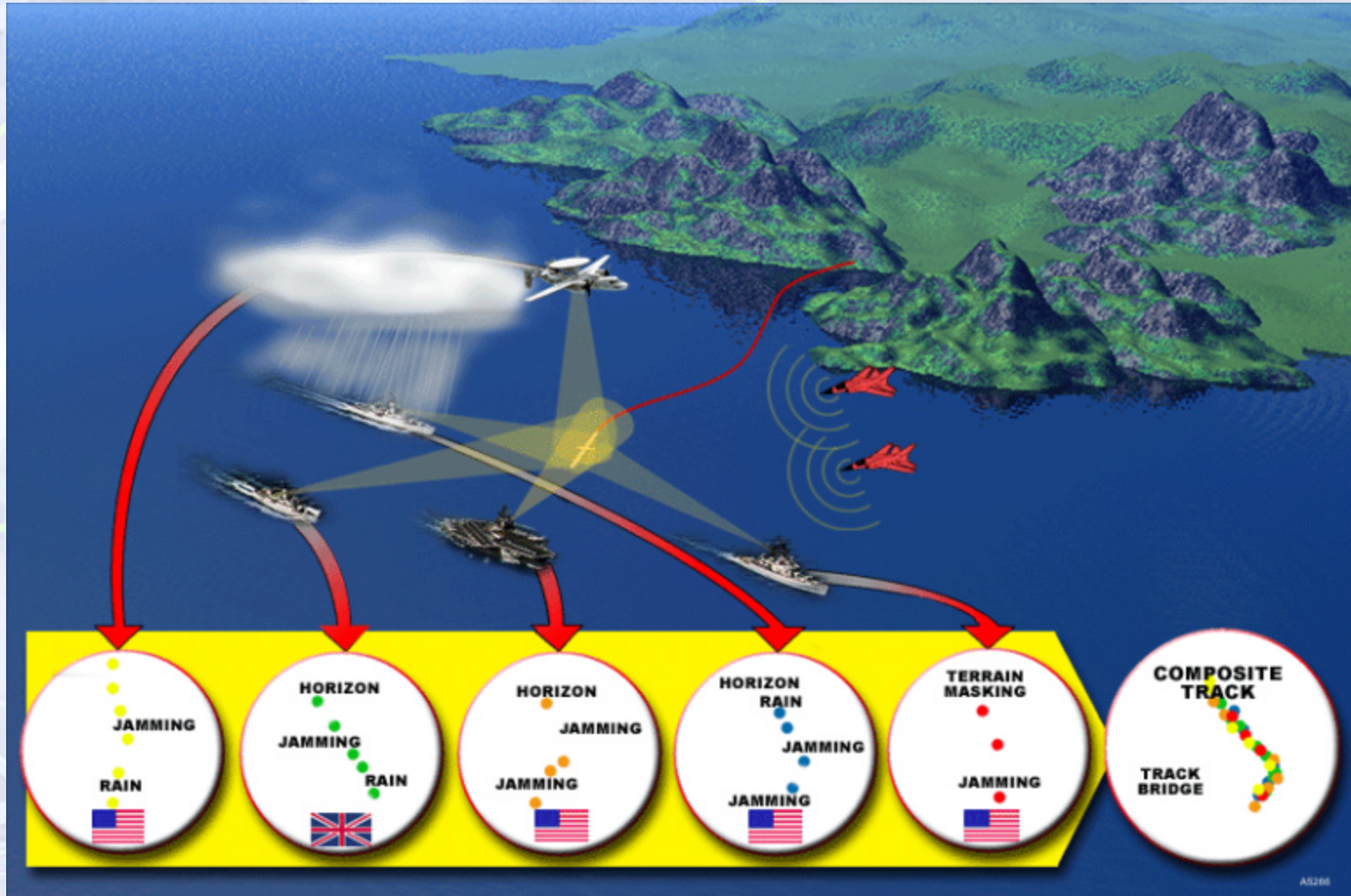
Benefits realized by all units

- Improved track accuracy
- Track continuity
- Common track picture
- Improved awareness
- Increased battlespace

CEC is a revolutionary air defense capability without adding new sensors or weapon systems
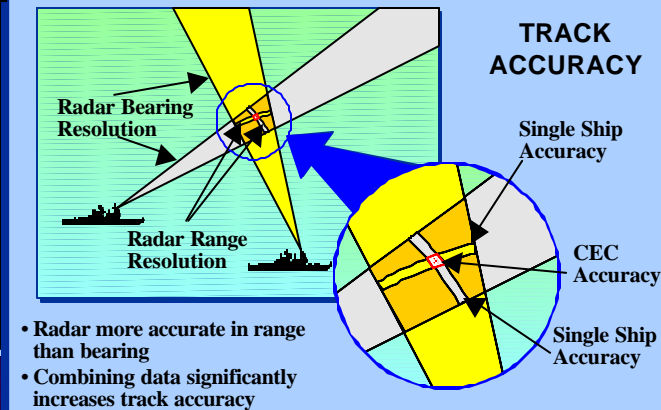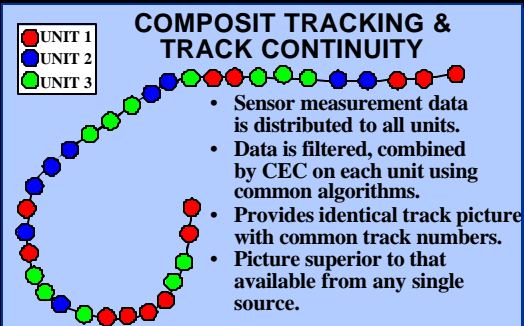
Air Defense is a Battle Force Operation

CEC tracking enables the transformation to battle force-centric air defense

CEC Attributes

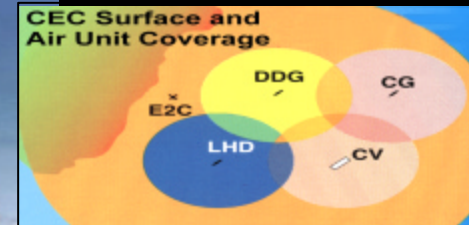**COMPOSITE TRACKING BENEFITS**
– Track Accuracy, Continuity, & ID Consistency
– Identical Picture, Track Numbers on All Units
– Reduced Reaction, Extended Engagement Ranges
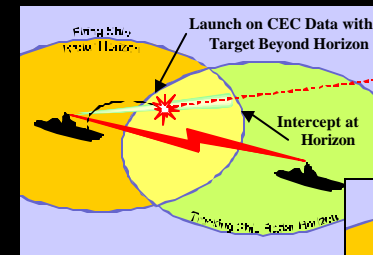
SENSOR COOPERATION

COMPOSIT TRACKING & TRACK CONTINUITY

UNIT 1
UNIT 2
UNIT 3

- Sensor measurement data is distributed to all units.
- Data is filtered, combined by CEC on each unit using common algorithms.
- Provides identical track picture with common track numbers.
- Picture superior to that available from any single source.

TRACK ACCURACY

Radar Bearing Resolution

Radar Range Resolution

Single Ship Accuracy

CEC Accuracy

Single Ship Accuracy

- Radar more accurate in range than bearing
- Combining data significantly increases track accuracy

Resulting in…
Single Track Picture with Consistent ID

COVERAGE TO ENGAGEMENT

CEC Surface and Air Unit Coverage

DDG
CG
E2C
LHD
CV

COOPERATIVE ENGAGEMENT

Launch on CEC Data with Target Beyond Horizon

Intercept at Horizon

CUED ENGAGE

ENGAGE ON REMOTE
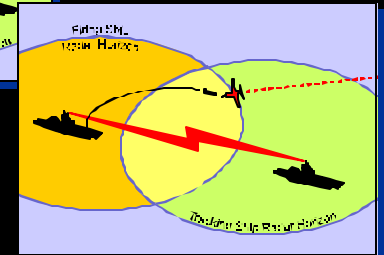
INTEGRATION

CEC EXPANDS THE BATTLESPACE

CEC Warfighting Benefits

Significantly improves defense of the battle force from cruise missile and other airborne threats
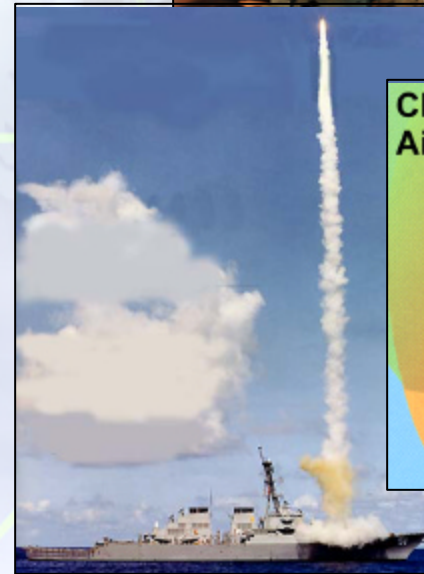
Expands battlespace awareness

Extends threat engagement range

Provides identical composite air picture to all participants

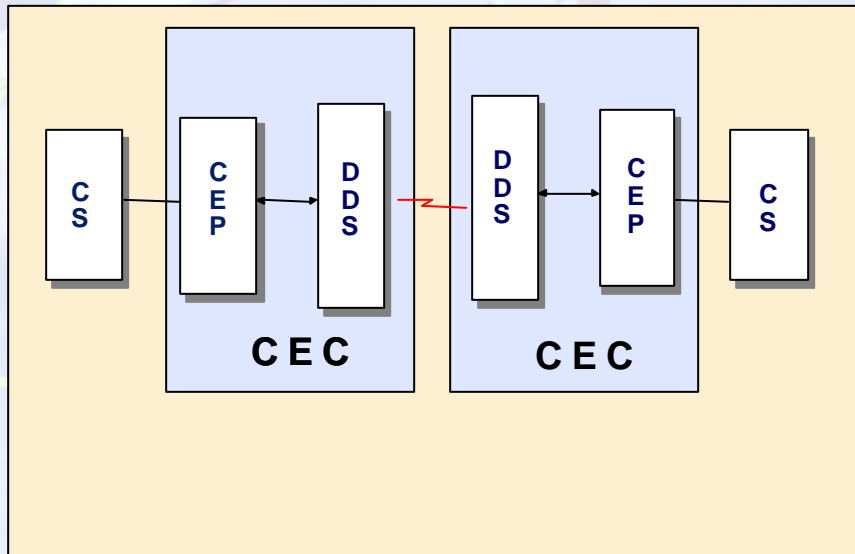Increases reaction time in dealing with threats

Improves connectivity in jamming environments

CEC Surface and Air Unit Coverage
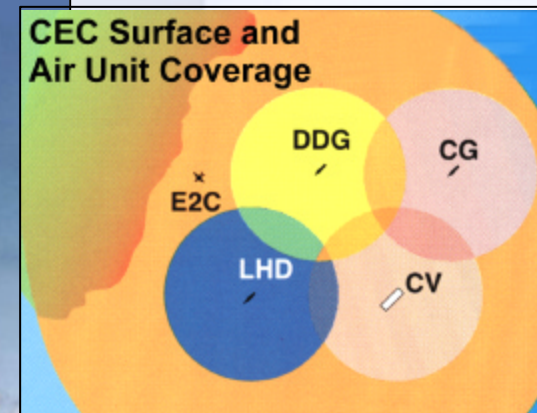
CEC is a force multiplier

System Partitioning

CEC is partitioned into two segments

CS   – Combat Systems (including sensors)
CEP – Cooperative Engagement Processor
DDS – Data Distribution System

Cooperative Engagement Processor

- Provides force-wide sensor integration
  - Composite track formation
- Identical kernel function provides real-time fusion of local/remote sensor data
- Adaptation layer tailored to each unit's combat system, performs translation of battle force sensors to common format

Data Distribution System (DDS)

- Real-time dedicated C-band link
- Highly adaptable network architecture
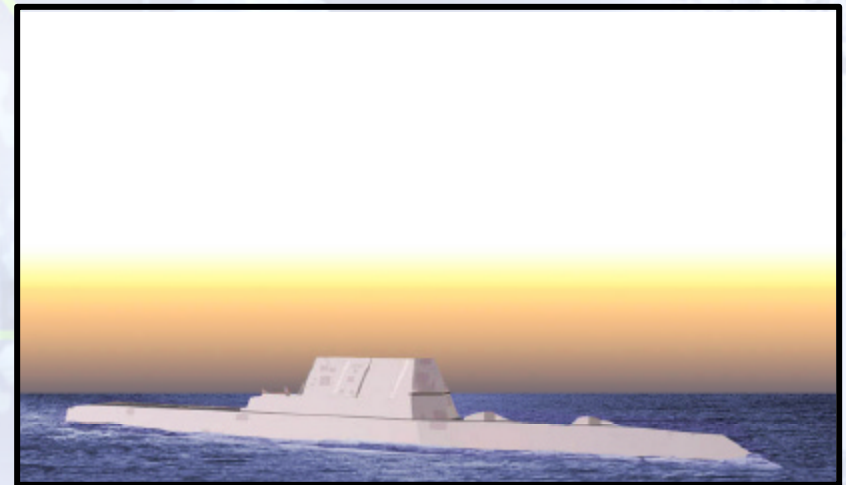- High-bandwidth, jam-resistant communications

Exploiting New Sensors

Composite Tracking

- CEC fuses data from all network sensors based on their contribution to the track
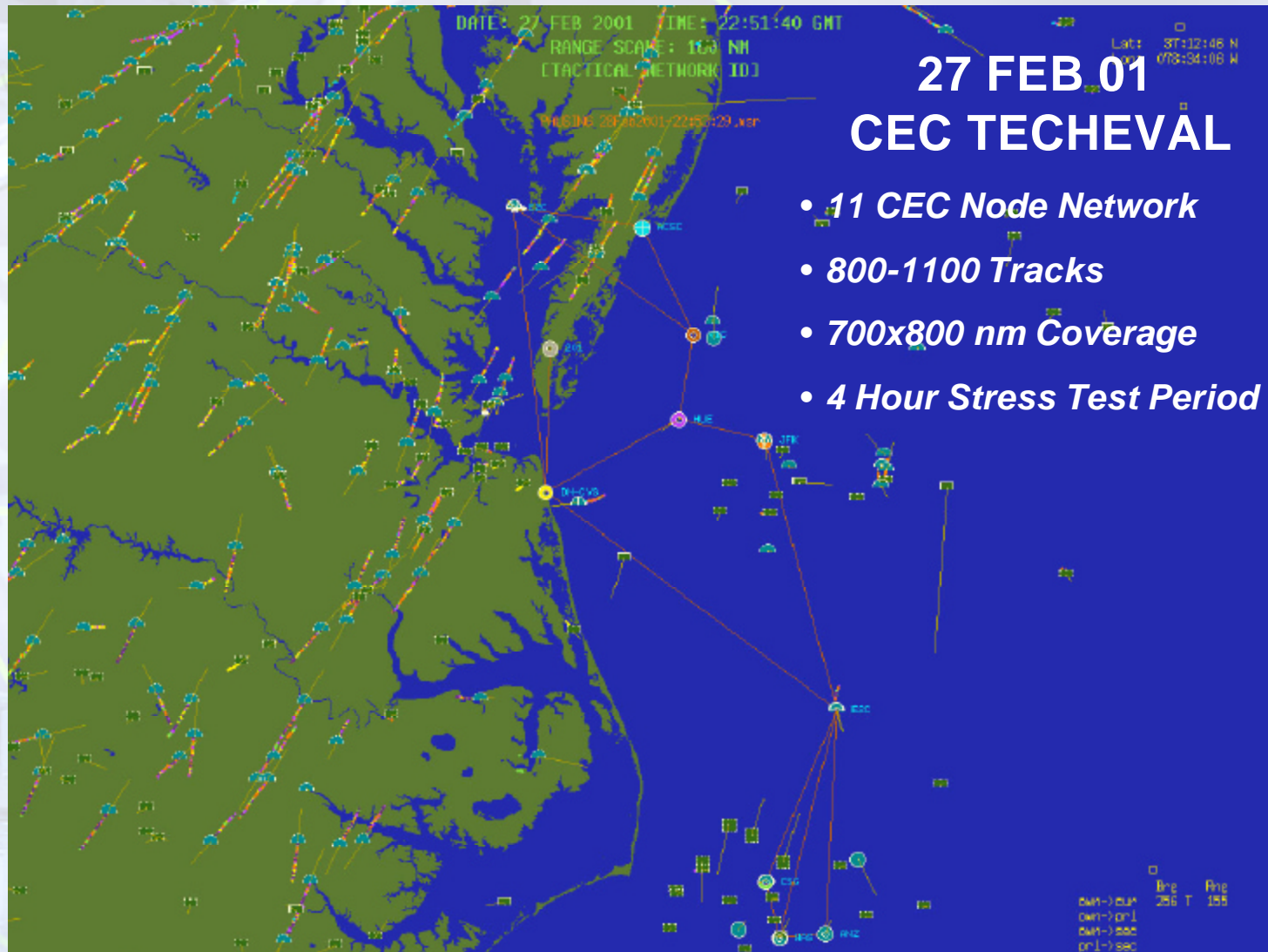- New sensor capabilities can be readily accessible by all CEC units at the measurement level

Sensor Invariance

- Sensor registration via the CEC network allows new sensor integration without changing existing units


CEC tracking concept leverages capital assets

Operationally Effective and Suitable

27 FEB 01
CEC TECHEVAL

- *11 CEC Node Network*
- *800-1100 Tracks*
- *700x800 nm Coverage*
- *4 Hour Stress Test Period*

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Summary

- CEC is not a new sensor or weapon system

- CEC leverages off existing sensor capabilities

- Exploits new assets for the entire battle force

- CEC composite tracking enables network-centric air defense

- Expands battlespace awareness

- Extends threat engagement range
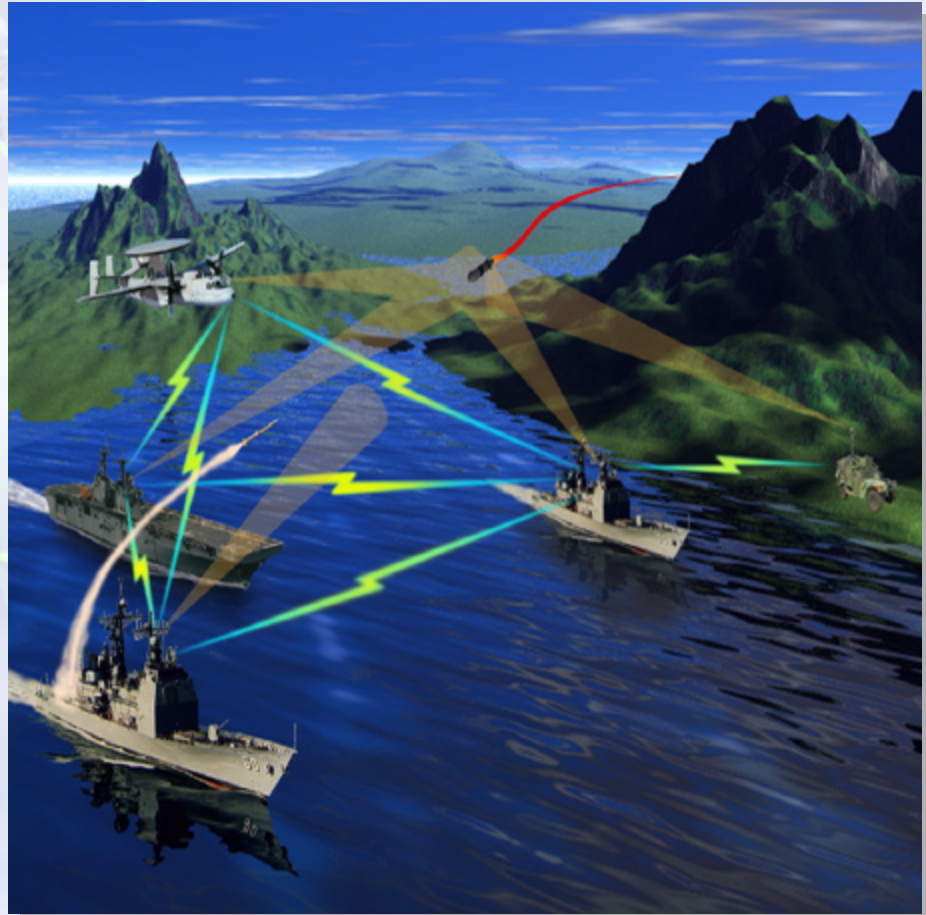
CEC keeps legacy systems viable throughout their service life